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Can Tariff-Jumping Foreign Investment Be Beneficial?

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Can tariff-jumping foreign investment be beneficial? It is well known that tariff-jumping foreign investment is costly. The tax paid by foreign firms may not be sufficient to offset that cost. We present a model that incorporates two additional benefits of foreign investment. Being more efficient, foreign firms generally pay higher wages than domestic firms and generate spillovers that enable domestic firms to become more efficient and competitive. Our analysis suggests that attracting foreign investment through import protection can improve welfare if the spillover effect is significant. However, once domestic firms have learnt their trade, developing economies should liberalize trade to reduce the distortion cost.

I. Introduction

In the 1990's, foreign direct investment became the largest single source of external finance for developing countries. In 1997, direct investment accounted for about half of all private capital and 40 percent of total capital flows to developing countries (Lipsey (1999)). Following the virtual disappearance of commercial bank lending in the 1980's, emerging economies eased restrictions on incoming foreign investment and offered special incentives to foreign enterprises - including lower income taxes or income tax holidays, import duty exemptions, and subsidies for infrastructure.

Is such a shift in the policy towards foreign investment sensible? How should the welfare impact of foreign investment be evaluated? The early literature on foreign investment points out the downside risk of foreign investment in a protected trade regime. The so-called tariff-jumping foreign investment, common in many developing economies, would actually reduce the welfare of the host economy. This argument against foreign investment can be modified if the income of foreign capital is taxed. However, the gain due to the corporate income tax paid by foreign capital is likely to be moderate.

Can tariff-jumping foreign investment improve the welfare of a host economy in ways other than the income tax it pays? There are additional benefits within the framework of perfect competition, if it is recognized that in a developing economy, foreign firms usually possess superior technology in the sense that factors they employ are more productive than those in domestic firms. One benefit is that workers employed by foreign firms often receive higher wages than those working for domestic firms. The other benefit is that the presence of foreign firms often creates a competitive environment in which domestic firms are pressured

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to improve their productivity. This is often termed as the spillover effect of foreign investment.

The present paper makes an attempt at modeling formally these two benefits of tariff-jumping foreign investment. We develop a general equilibrium model with two economies, two goods and two factors. The host economy attracts foreign investment with import protection as a means to develop the domestic capital-intensive sector. Our main interest is to assess to what extent the sum of these two benefits plus the corporate income tax paid by foreign firms can outweigh the efficiency loss that has been identified for tariff-jumping foreign investment. It is apparent that a search for unambiguous general analytical results is likely to be futile. But it is useful to get, at least, a feel for the magnitude of the various welfare effects of foreign investment. For that purpose, we make use of simulation.

Our main finding is that the efficiency loss resulting from tariff-jumping foreign investment can be sizeable. By themselves, the revenue from corporate income tax and the higher wages paid by foreign firms may not be sufficient to offset the cost of tariff-jumping foreign investment. However, foreign investment can bring in net benefits if there are significant spillovers. Our finding suggests a possible superior dynamic sequence of trade and investment policies for a developing economy. Initially when a developing economy does not have much of manufacturing industries, a kind of import protection-cum-investment incentives may help it to become industrialized. But after domestic firms have learnt their trade and become more efficient through the spillover effect of foreign investment, the developing economy should liberalize trade to reduce the efficiency loss from tariff-jumping foreign investment.

The rest of the paper is organized as follows. The next section provides a brief review of the literature on foreign investment and provides a backdrop for the present paper. The following section presents the complete analytical model. Then, we use simulation to assess the likely quantitative importance of various welfare effects of foreign investment under discussion. The last section concludes the paper.

II. Literature Review

How does foreign investment affect the welfare of a host economy? Early models of capital movement regard goods trade and capital movement as substitutes for each other. This view is based on the Heckscher-Ohlin model that relates goods trade to inter-country differences in factor endowments. On the one hand, goods trade tends to equalize factor prices between economies, reducing the pressure for international factor movement. On the other hand, when factors move from where they are abundant to where they are scarce, the bases for trade are reduced, or disappear.

Mundell (1957) first formally analyzes the interaction between import protection and capital movement. Invoking the Stolper-Samuelson theorem, Mundell shows that when a tariff is imposed by the labor-abundant country, the return to capital is increased, and capital moves there; with perfect capital mobility, trade eventually disappears. This type of analysis later gave rise to the literature on "tariff-jumping" investment. Major contributions to this literature include Johnson (1967), Bhagwati (1973), Brecher and Diaz-Alejandro (1977),

Jones (1984), and Neary and Ruane (1988). The main insight of this literature is that inflow of foreign capital is immiserizing in a trade regime with import protection.

Attracting foreign investment with import protection is a fairly common policy mix among developing economies. Under the import substitution approach to economic development, primacy is given to nurturing infant indigenous industries. Foreign investment is regarded as a means to this end to the extent that it brings in advanced technologies and know-how and transfer them to domestic firms. Though we have mentioned, so far, only the import protection in the form of tariffs, there is a wide range of measures that can be adopted, in practice, to promote industrialization. Typically, a foreign investment approval procedure is instituted to limit the number of foreign firms and to pick the projects that are most likely to transfer the desired technology and know-how to the host economy. Often a "priority industry" test is used to judge whether a potential foreign investment project is capable of bringing new technologies and new products to the economy. In fact, many host economies following this policy paradigm do not just passively review project proposals, they actively solicit the kind of investments that would benefit them.

Models of tariff-jumping foreign investment usually do not assume that the host country taxes the income of foreign capital. Bond (1991) has argued that an inflow of foreign investment need not be immiserizing if the host economy can tax the income of foreign capital. He develops a general equilibrium model with foreign capital taxation for a small economy ("small" both in goods and capital markets). He finds that the optimal import tariff for a small host economy is positive when the importable good is capital-intensive and the tax paid in the home country is credited in the home economy of foreign capital.

Though the corporate income tax paid by foreign capital is clearly a benefit, it may not be, for two reasons, large enough to outweigh the welfare loss of foreign investment in a protected trade regime. On the one hand, the ability of developing economies to tax the income of foreign capital is severely constrained in today's world of foot-loose capital movement. Developing economies are, in general, cornered into a no-win situation of tax competition. They have to compete against one another by offering tax incentives. Multinational firms can easily resort to transfer pricing to evade their tax liabilities. Therefore, there exists a very low ceiling for the corporate income tax rate that developing economies can enforce effectively. On the other hand, the income tax paid by foreign firms does not constitute a net benefit because foreign firms also benefit from and consume their share of the public good, especially infrastructure, provided by the government of the host economy. Therefore, the gross benefit of the corporate income tax should be offset by the cost of providing the necessary public service to foreign firms. It is not uncertain whether foreign capital has paid its fair share of the cost of proving public service and infrastructure through its income tax. Therefore, it is questionable whether Bond's argument can make tariff-jumping foreign investment not "immiserizing".

Does foreign investment bring other benefits that could outweigh the welfare cost of foreign investment in a protected trade regime? Without getting into the complicated world of imperfect competition, two major benefits of foreign investment have long been recognized, at least informally. One benefit is that foreign firms tend to pay higher wages than domestic firms do. In this way, the host economy shares part of the productivity gain imparted by foreign investment. The other benefit is the spillovers of foreign investment, i.e.,

the efficiency gains among domestic firms resulting from the increased competition in domestic markets from the entry of foreign-owned firms. Foreign competition promotes more rapid adoption of new technology and best-practice management techniques on the part of domestic firms through demonstration effects, vertical linkages and so forth. When foreign firms introduce new products or processes to the domestic market, domestic firms may benefit from the accelerated diffusion of new technology (Teece (1977)). In some cases, domestic firms may increase productivity simply by observing nearby foreign firms. In other cases, diffusion may occur from labor turnover as domestic employees move from foreign to domestic firms. Foreign firms often provide more on-the-job training programs than their domestic counterparts (Gonclaves (1986)). The key to appreciate these two benefits is to recognize a stylized fact: foreign firms usually have the competitive edge of a superior technology. In other words, factors can be made more productive in the hands of foreign firms than in those of domestic firms, especially in a developing economy.

The available evidence (e.g., Globerman *et al.* (1994)) is consistent in showing that foreign firms tend to have higher average labor-productivity levels than domestic firms do. There is ample evidence of the spillovers of foreign investment. Caves (1974) has found that the positive disparity between foreign and domestic value added per worker disappeared as foreign firms employed an increasing share of the labor in the sector, which is consistent with the spillover hypothesis. In a similar study using cross-section sectoral data for Canadian manufacturing industries in 1972, Globerman (1979) has found a weak spillover effect. Blomstrom and Persson (1983), Blonstrom (1986), Blomstrom (1989) have found that in Mexico, sectors with higher foreign ownership exhibited higher levels of productivity, faster productivity growth, and faster convergence of productivity to U.S. norms. However, empirical evidence is not always clear-cut. In a recent study, Aitken and Harrison (1999) has found, using panel data on Venezuelan plants, that foreign equity participation is positively correlated with plant productivity (the "own-plant" effect), but foreign investment negatively affects the productivity of domestically owned plants.

III. The Model

To recapture the above discussion, the distinction of the present model is to incorporate the two benefits of foreign investment that have not received due recognition in theoretical models. It is assumed that foreign firms possess a superior technology. One benefit is that foreign firms pay a higher wage than domestic firms do so that the host economy can share part of the productivity gain. The other benefit is that the inflow of foreign investment may generate spillovers in the form of pushing up the productivity of domestic firms.

Consider a world that consists of a developing economy (home) and a developed economy (foreign). The developed economy is both more abundantly endowed with capital and more advanced technologically. Therefore, the developed economy exports the capital-intensive good in exchange for the labor-intensive imports from the developing economy. Furthermore, there is a movement of capital from the developed economy to the developing economy.

We make use of the classical trade model that is characterized by perfect competition

and trade in homogeneous goods. Under perfect competition, prices are set by unit costs. Technology is represented by a Cobb-Douglas unit cost function. Let p_i and S_i, i = 1,2, be the price and supply (produced by domestic firms) of the two goods, w and r be the wage rate and the rental rate, t be the tariff rate on the imports of the capital-intensive good in the developing economy. The perfect competition conditions for the two sectors in the developing economy are:

$$p_1 = A_1 w^{1-a_1} r^{a_1}, \quad S_1 \geq 0, \quad S_1\left(p_1 - A_1 w^{1-a_1} r^{a_1}\right) = 0 \tag{1}$$

$$(1+t)\,p_2 = A_2 w^{1-a_2} r^{a_2}, \quad S_2 \geq 0, \quad S_2\left((1+t)\,p_2 - A_2 w^{1-a_2} r^{a_2}\right) = 0 \tag{2}$$

These two conditions are specified in a general way to encompass the possibility of complete specialization. One of S_1 and S_2 may be zero in equilibrium.

Full employment of factors gives the other set of equilibrium conditions on the supply side. In the presence of foreign investment, the developing economy consists of two sub-economies: one for domestic firms and the other for foreign firms. Let L and K be the supplies of labor and capital of the developing economy, L_H^* be the labor employed by foreign firms. The labor (capital) demand per unit of output is equal to the derivative of the unit cost function with respect to the wage rate and the rental rate. The factor market equilibrium conditions for domestic firms are:

$$(1-\alpha_1)A_1\left(\frac{w}{r}\right)^{-a_1} S_1 + (1-\alpha_2)A_2\left(\frac{w}{r}\right)^{-a_2} S_2 = L - L_H^* \tag{3}$$

$$\alpha_1 A_1\left(\frac{w}{r}\right)^{1-a_1} S_1 + \alpha_2 A_2\left(\frac{w}{r}\right)^{1-a_2} S_2 = K \tag{4}$$

Let w_H^* be the wage rate that foreign firms pay to workers in the developing economy. It is assumed that w_H^* is equal to or greater than *w*. Formally, the relation is specified by:

$$\beta w_H^* = w, \quad \beta \leq 1 \tag{5}$$

For the moment let us treat β as an exogenous parameter. In practice, it would be determined by the general condition of demand and supply in the labor market. The larger the incoming foreign investment is, the stronger the demand for local labor by foreign firms, and the smaller β would be.

Let $A_2^*(\leq A_2)$ be the productivity coefficient for foreign firms producing good 2. Under perfect competition, we have:

$$(1+t)\,p_2 = A_2^* w_H^{*\,1-a_2} r_H^{*a_2} \tag{6}$$

This equation determines r_H^* in terms of w_H^* and $(1+t)p_2$. Perfect competition entails that the ratio of the labor income share to the capital income share is given by the nature of the assumed technology.

$$\frac{w_H^* L_H^*}{r_H^* K_H^*} = \frac{1-\alpha_2}{\alpha_2} \tag{7}$$

Then (7) determines L_H^* in terms of K_H^* for given w_H^* and r_H^*. The last element for specifying the foreign-owned sub-economy is the output of good 2 produced by foreign firms in the developing economy, which is denoted by S_{2H}^*. It is given by

$$\alpha_2 \left(\frac{w_H^*}{r_H^*} \right)^{1-\alpha_2} S_{2H}^* = K_H^* \tag{8}$$

i.e., S_{2H}^* is proportional to K_H^*.

The specification of the developed economy is similar to that of the domestic-owned sub-economy in the developing economy. Let '*' denote the corresponding variables for the developed economy. The supply side of the developed economy consists of the following four equations:

$$p_1 = A_1^* w^{*1-\alpha_1} r^{*\alpha_1}, \quad S_1^* \geq 0, \quad S_1^* \left(p_1 - A_1^* w^{*1-\alpha_1} r^{*\alpha_1} \right) = 0 \tag{9}$$

$$p_2 = A_2^* w^{*1-\alpha_2} r^{*\alpha_2}, \quad S_2^* \geq 0, \quad S_2^* \left(p_2 - A_2^* w^{*1-\alpha_2} r^{*\alpha_2} \right) = 0 \tag{10}$$

$$(1-\alpha_1) A_1^* \left(\frac{w^*}{r^*} \right)^{-\alpha_1} S_1^* + (1-\alpha_2) A_2^* \left(\frac{w^*}{r^*} \right)^{-\alpha_2} S_2^* = L^* \tag{11}$$

$$\alpha_1 A_1^* \left(\frac{w^*}{r^*} \right)^{1-\alpha_1} S_1^* + \alpha_2 A_2^* \left(\frac{w^*}{r^*} \right)^{1-\alpha_2} S_2^* = K^* - K_H^* \tag{12}$$

Having specified the supply side of the model, we turn to the demand side. The income of the developing economy consists of four distinct components as specified below:

$$Y = w\left(L - L_H^*\right) + rK + tp_2\left(D_2 - S_2\right) + w_H^* L_H^* + \tau r_H^* K_H^* \tag{13}$$

The first two terms are the labor and capital income generated by domestic firms. The third term is import tariff revenue. The forth term is the wages of the workers employed by foreign firms. The last term is the corporate income tax paid by foreign firms, where τ is the corporate income tax rate. In comparison, the income of the developed economy is much simpler.

$$Y^* = w^* L^* + r^*(K^* - K_H^*) + (1-\tau) r_H^* K_H^* \tag{14}$$

Preferences are represented by a simple Cobb-Douglas utility function. In other words, the expenditure shares for the two goods are constant. Let α be the expenditure share for good 1. The home demand functions for the two goods are:

$$D_1 = \frac{\alpha Y}{p_1} \tag{15}$$

$$D_2 = \frac{(1-\alpha)Y}{(1+t)p_2} \tag{16}$$

Similarly, the two foreign demand functions are:

$$D_1^* = \frac{\alpha Y^*}{p_1} \tag{17}$$

$$D_2^* = \frac{(1-\alpha)Y^*}{p_2} \tag{18}$$

According to Walras' law, the world equilibrium can be given by the balance between demand and supply in either of the two goods markets. We opt to use that for good 1.

$$S_1 + S_1^* = D_1 + D_1^* \tag{19}$$

The system of equations from (1) to (19) forms a complete set that must be solved together to determine the equilibrium values of p_1, p_2, w_H^*, w^*, r, r_H^*, r^*, S_1, S_2, S_{2H}^*, S_1^*, S_2^*, Y, Y^*, D_1, D_2, D_1^*, D_2^*, L_H^*. In solving the model, we set $w=1$ and designate the unit of the labor in the developing economy as the numéraire. Once the endogenous variables are solved, trade balance and the welfare levels of the two economies can be computed as follows:

$$TB = p_1(S_1 - D_1) + p_2(S_2 - D_2) = (1-\tau) r_H^* K_H^* \tag{20}$$

$$U = D_1^{\alpha} D_2^{1-\alpha} \tag{21}$$

$$U^* = D^*{}_1^{\alpha} D^*{}_2^{1-\alpha} \tag{22}$$

Apart from the specification of the foreign-owned sub-economy in the developing economy, the present model is a standard 2-country, 2-goods, and 2-factors trade model. The

novelty of the present model lies in the way in which foreign investment is specified. Here, we deliberately confine foreign investment to the import-competing sector (good 2). In contrast, most models in the existing literature depict foreign investment simply as an addition to the supply of local capital without specifying a separate foreign-owned sector.

Our modeling choice is motivated by three considerations. First, the specification of a separate foreign-owned sub-economy in the developing economy is necessitated by the assumption that foreign firms enjoy a technological advantage against domestic firms. Second, we want to focus on the effects of the tariff-jumping foreign investment that substitutes the imports of good 2 in the developing economy. This is the kind of foreign investment the literature reviewed in the preceding section analyzes. Finally, it makes our analysis much simplified.[1]

Another feature that simplifies our analysis is that we deliberately treat the volume of foreign investment (K_H^*) and the wage premium factor paid by foreign firms, b in (5), as exogenous. We could have modeled foreign investment as an endogenous variable, being a positive function of the after-tax return on capital or in the case of perfect capital movement which entails equalization of after-tax returns on capital between the two economies (given that the tax credit feature is not incorporated). But we must cope with an arbitrary choice of how to calibrate the supply function of foreign capital. But even though inflow of foreign capital is treated as exogenous, we can easily show how the model would behave when the supply of foreign capital becomes more or less elastic with respect to the return on capital. A simple technique that we use here is to carry out two simulations with two different volumes of foreign investment. From the comparison of such two simulation results, we can infer the consequences of a more or less elastic supply of foreign capital. Similarly, we could have modeled b as a negative function of the volume of foreign investment. In other words, the wage premium becomes larger, the more foreign capital moves in. That relation appears to be sensible, but it is just as *ad hoc* as treating b as exogenous. In short, the present model could have been extended easily by incorporating an endogenous foreign investment and an endogenous wage premium paid by foreign firms in the developing economies. As a matter of fact, we present a specific example of such extension in our simulation reported below.

1. In principle, we could have designed a more general specification of the foreign-owned sub-economy that allows foreign firms to produce the exportable (good 1), too. This is also a relevant feature of the real world. In fact, much of the foreign investment in developing economies flows into the export sector. However, if we do that, we have to cope with the entailed complication of whether the foreign-owned sub-economy in the developing economy and the developed economy would be diversified in producing both goods or specialized in producing only one of the two goods. With the same technology but different factor prices, it is not possible that both economies would be diversified in producing the two goods. It would be very tedious and distracting to track down the three distinct possibilities: 1) the foreign-owned sub-economy is specialized in producing good 2 and the developed economy is diversified (the present model), 2) the foreign-owned sub-economy is diversified and the developed economy is specialized in producing good 2, 3) the foreign-owned sub-economy is specialized in producing good 1 and the developed economy is specialized in producing good 2.

IV. Simulation Results

The benchmark equilibrium is specified as follows. We make the developing economy as the reference point for comparison. In the closed economy equilibrium, the developing economy produces and consumes 100 units of both goods. To make good 2 more capital-intensive than good 1, it is assumed that $a_1 = 0.3$ and $a_2 = 0.7$. In the benchmark equilibrium, we set $w = 1$ and $r = 0.1$. Accordingly, it is derived that $A_1 = 1.995$ and $A_2 = 5.012$. And the required factor supplies are: $L = 100$ and $K = 1000$. The implied q is 0.5.

The developed economy is more capital-abundant. Without complicating the analysis with the size issue, it is assumed that the developed economy has the same size of labor supply: $L^* = 100$, but three times more capital: $K^* = 3{,}000$. Further, it is assumed that production in the developing economy is less efficient in the sense that $A_1/A_1^* = A_2/A_2^* = 1.5$.[2]

The simulation results are reported in Table 1. The variables are arranged in rows and simulation results in columns. The symbols for each variable are the same as defined in equations 1-22. Exogenous variables and parameters are shown above endogenous variables so that it is easy to relate the change in endogenous variables to the change in exogenous variables. The environment for each simulation is specified by a mix of the five exogenous variables and parameters: b, A_1, A_2, t, t, and K_H^*. The benchmark equilibrium is a free-trade equilibrium without capital movement, reported in the S1 column (Simulation 1). In this equilibrium, the developing economy exports good 1 and imports good 2 with a trade balance of 68.18 (in terms of the numéraire, home labor because of $w = 1$). Note that under free trade, the output of good 2 (S_2) in the developing economy is only 7.89 (%) of that (i.e., 100) of the closed economy equilibrium. The welfare level (U) of the developing economy under free trade is 107.87. Compared to the welfare of a closed economy ($U = 100$), free trade brings a sizeable gain (7.87%). This benchmark equilibrium exemplifies a typical situation for many developing economies that wish to embark on industrialization.

Now let us assume that the developing economy desires to promote the import-competing sector with import tariffs. A 20% tariff, the average import tariff rate among developing economies, is levied on the imports of the capital-intensive good. The results are reported as Simulation 2 shown in the S2 column. The effect of the 20% import tariff is to boost the domestic production (S_2) of good 2 from 7.89 to 48.51. With the imposition of the import tariff, the developing economy still imports the capital-intensive good, but the value of the imported capital-intensive good ($p_2 X_2$) shrinks from 68.18 to 42.17. Because the two economies are equal in terms of labor force, neither of the two can be

2. Though the present study assumes that the technological gaps are equal in both sectors, this is not the only plausible assumption. Another plausible specification is that $A_1^*/A_1 \geq A_2^*/A_2$. In other words, the comparative advantage in trade can also be due to the Ricardian type of technological differences between the two economies. The comparative advantage of the developed economy in producing good 2 may also be due to a relative technological superiority. Nevertheless, our current choice looks as good as any other alternative.

regarded as a small open economy. Both have some influence over the terms of trade. Since free trade is not optimal for either of the two economies, the optimal tariff rate is positive. In the present case, the use of the import tariff actually raises the welfare of the developing economy marginally from 107.87 to 108.02, and reduces the welfare of the developed economy from 262.94 to 260.85. The gain in welfare for the developing economy is solely due to the improvement in the terms of trade (p_1/p_2) from 1.37 to 1.44. Nevertheless, import protection creates a costly distortion.

As is described by the Stolper-Samuelson theorem, import protection affects factor prices. In the present case, a 20% increase in the domestic price of the capital-intensive good raises the domestic rental rate from 0.045 to 0.063, an increase of 40%. Now, the import-substitution regime in the developing economy becomes attractive to foreign investment. Besides, the developing economy may also desire to attract foreign investment in an attempt to develop its sector 2. So let us consider the effects of foreign investment.

Two simulations are computed respectively with $K_H^* = 150$, 300, or respectively 5% and 10% of the capital supply of the developed economy. It helps to regard these two inflows of foreign investment as if they were derived from two capital supply functions with different elasticities with respect to the return on capital. Therefore, a comparison of the two simulation results can show how the elasticity of foreign investment with respect to the return on capital would affect the behavior of the model. The two simulations are reported Simulations 3 and 4 shown in the S3 and S4 columns. To proceed step by step, we assume, in computing these two simulations, that foreign firms pay the same wage rate as domestic firms. In other words, $b = 1$, which is the usual setting analyzed in the existing literature. As is well known, such tariff-jumping foreign investment reduces welfare. Compared to the results of Simulation 2, the welfare of the developing economy is reduced from 108.02 to 105.06 in the case of $K_H^* = 150$ and to 102.16 in the case of $K_H^* = 300$. Apparently, the more foreign capital moves in, the worse off the developing economy becomes.

However, it is important to observe that foreign investment improves world efficiency in this case. With a superior technology, foreign firms have made the labor they employ in the developing economy more productive. It is just that the developed economy captures all the efficiency gain in this case. Compared to the results of Simulation 2, the welfare of the developed economy increases from 260.85 to 265.15 in the case of $K_H^* = 150$ and to 269.40 in the case of $K_H^* = 300$.

As is intended, sector 2 of the developing economy expands. As shown in the row for S_{2H}^* , foreign firms produce 33.11 units of good 2 in Simulation 3 and 65.90 in Simulation 4. Interestingly, the output of good 2 produced by domestic firms (shown in the row for S_2) also increases slightly in both cases. In other words, such tariff-jumping foreign investment mainly substitutes the imports of good 2 from the developed economy. As shown in the row for $p_2 X_2$, the developing economy remains to be an importer of the capital-intensive good in Simulation 3, though the value of imports is down to 17.0. In contrast, in Simulation 4, the volume (300) of capital inflow is large enough to turn the developing economy from an importer of good 2 into an exporter of good 2. In fact, the developing economy now exports both goods: 25.23 for the value of exporting good 1 and 7.35 for the value of exporting good

2. The trade surplus of 32.58 is used to pay the repatriated income of foreign capital.

So far, these results are well known. Now let us introduce the additional benefits of foreign investment incorporated in the present model. First, we introduce the feature of the wage premium paid by foreign firms. To demonstrate this possibility, it is assumed that the wage rate paid by foreign firms is 10% higher than that paid by domestic firms. In other words, $b = 1/1.1 = 0.91$. Again, two simulations are computed for $K_H^* = 150$ and $K_H^* = 300$. The results are reported as Simulations 5 and 6 shown in the S5 and S6 columns. Since part of the efficiency gain resulting from foreign investment is now passed onto local labor in the form of higher wages, the welfare of the developing economy gains somewhat. Comparing Simulation 5 to Simulation 3 and Simulation 6 to Simulation 4, the welfare of the developing economy has increased marginally from 105.06 to 105.57 in the case of $K_H^* = 150$ and from 102.16 to 103.15 in the case of $K_H^* = 300$. In absolute terms, the gain in welfare is not very large. This is because the labor employed by foreign firms accounts for only 6.22 (%) and 12.29 (%) of the labor force in the developing economy respectively. The benefit from the wage premium can be easily approximated using the formula: the gain (%) = the wage premium (%) times the share in GNP of the wage income of the workers employed by foreign firms.

Although the 10% wage premium we have set is just an illustration, it is chosen on the basis of an intuitive feel for what is realistic in the real world. Theoretically, the wage premium can go up all the way to 50%, since by assumption, workers employed by foreign firms are now 50% more productive as a result of the superior technology in comparison with those working in domestic firms. But in practice, it is more likely that the bargaining power of local workers is much weaker than that of foreign firms so that the latter captures most of the rent. Though the number is chosen arbitrarily, it is still informative to observe that the gain from the wage premium at 10% is not sufficient to outweigh the welfare loss due to foreign investment in a protected trade regime. Comparing Simulations 5 and 6 to Simulation 2, the welfare (105.57 and 103.15) of the developing economy with foreign investment is still less than that (108.02) without foreign investment. Of course, the higher the wage premium is, the more welfare gain the developing economy would enjoy.

To further boost the benefit of foreign investment, we next introduce the corporate tax levied on the income of foreign firms. It is assumed that corporate income tax is collected at the rate of 30%, a fairly high estimate of what developing economies can effectively enforce. Similarly, two simulations are computed for two levels of foreign investment: $K_H^* = 150, 300$. The results are reported as Simulations 7 and 8 shown in the columns of S7 and S8. In comparison, the corporate income tax appears to be a more sizeable benefit for the host country. Comparing Simulation 7 to Simulation 5 and Simulation 8 to Simulation 6, the welfare of the developing economy increases from 105.57 to 108.90 in the case of $K_H^* = 150$, and from 103.15 to 109.77 in the case of $K_H^* = 300$. Clearly, when corporate income tax is collected, more foreign investment is better than less.

However, this result must be qualified. As discussed in the preceding section, this tax benefit of foreign investment should be offset by the cost of providing public service consumed by foreign firms. If that factor is incorporated, the net gain for the host economy may not be positive. Furthermore, developing economies are usually compelled to compete

with one another for foreign investment with tax incentives. Accordingly, the effective tax rate may not be as high as 30%. In view of this consideration, the tax benefit from foreign investment is likely to be marginal. In short, it is probable that the sum of the two benefits analyzed above may be modest in magnitude, not sufficient to offset the negative influence imparted by trade distortion.

Now, we proceed to evaluate the main theme of the present paper. As a result of the competition from foreign firms and the spillover effect, domestic firms may manage to improve their efficiency. Specifically, we consider the case that the efficiency of domestic firms increases by 10%. Again, let us proceed step by step. First we consider the case that A_1 and A_2 are reduced by 10%, but foreign and domestic firms pay the same wage rate. In other words, b is now set to be one. Two simulations are computed for $K_H^* = 150, 300$. The results are reported as Simulations 9 and 10 shown in the columns of S9 and S10. Comparing Simulation 9 to Simulation 7 and Simulation 10 to Simulation 8, the welfare of the developing economy is now raised from 108.90 to 118.97 in the case of $K_H^* = 150$ and from 109.77 to 119.33 in the case of $K_H^* = 300$. Approximately, the increase in welfare is proportional to the improvement in factor productivity. It is apparent that the spillover effect may well be much larger than the benefits that have been considered above. In other words, the most important benefit of foreign (direct) investment is likely to be this spillover effect. Through contacts with the more advanced and efficient operations of foreign firms, domestic firms can close the technology gap more effectively.

To complete our story, we restore the 10% wage premium paid by foreign firms. The results are reported as Simulations 11 and 12 shown in the columns of S11 and S12. The wage premium provides an additional benefit so that the welfare of the developing economy is further raised. Comparing Simulation 11 to Simulation 9 and Simulation 12 to Simulation 10, the welfare of the developing economy is now raised from 118.97 to 119.33 in the case of $K_H^* = 150$ and from 119.33 to 120.15 in the case of $K_H^* = 300$.

To sum up the main results of our simulation, import protection in the presence of foreign investment can be costly. A 20% tariff rate on the imports of good 2 raises the return on foreign capital by 38% (the percentage increase in r_H^* from 0.081 in Simulation 1 to 0.112 in Simulation 2) through a channel similar to the Stolper-Samuelson effect. This is a sizeable subsidy to foreign capital. Our simulation also shows that the benefits from the corporate income tax and the wage premium paid by foreign firms are likely to be modest and may not be large enough to offset the efficiency loss of tariff-jumping foreign investment. A more persuasive argument for attracting foreign investment in the presence of import protection is the spillover effect of foreign investment. Only when the inflow of foreign investment leads to significant productivity gains in domestic firms through spillovers can tariff-jumping foreign investment be rationalized. This conclusion supports the common practice in many developing economies that tie investment incentives to technology transfer and limit the pace and extent of foreign investment to a level that does not critically cripple domestic firms. In other words, foreign investment serves as a means to attain the aim of making domestic firms productive and competitive.

As mentioned in the introduction, a current policy issue for many developing

economies is whether trade liberalization in the presence of tariff-jumping foreign investment would be welfare-enhancing. To answer this question, we assume that the developing economy reduces the import tariff rate from 20% to zero and as a result of the decline in the rental rate, the stock of foreign investment falls back from 300 to 150. We also assume that the 10% efficiency gain in domestic firms is not reduced when some of foreign investment pulls out. This is a realistic feature. The last simulation is reported as Simulation 13 shown in the S13 column. Comparing Simulation 13 to Simulation 12, trade liberalization in the presence of tariff-jumping foreign investment can actually improve efficiency. The welfare level of the developing economy increases from 120.15 to 121.09. The reduction in foreign investment has two offsetting effects on the welfare of the developing economy. On the one hand, the developing economy gains from a reduction in the efficiency loss from tariff-jumping foreign investment, on the other hand, it loses some corporate income tax and the wage premium earned by workers employed in foreign firms. Theoretically, the net welfare effect is ambiguous, though it is positive in our specific example.

Of course, what we have here is only a specific example, which is not sufficient to draw some general results. However, this example does suggest a possible superior dynamic sequence of trade and investment policies for a developing economy. When a developing economy does not have much of manufacturing industries initially, specialization in exporting primary commodities under free trade may not offer enough potential for sustained growth. Therefore, some import protection-cum-investment incentives may help it to become industrialized. However, after domestic firms become more efficient through learning and under the pressure of foreign competition, it may be to the advantage of that developing economy to embark on a path of trade liberalization that can reduce the efficiency loss from tariff-jumping foreign investment.

For the curiosity of illustrating this idea, we extend the present model by endogenizing capital inflow (K_H^*), wage premium (b), the productivity levels of domestic firms (A_1 and A_2). We assume for simplicity that b , A_1 and A_2 are negative linear functions of K_H^*. In turn, K_H^* is a positive linear function of the rental rate differential ($r_H^* - r^*$). These four additional functions are calibrated such that under free trade, the equilibrium is the same as Simulation 1 and with 20% tariffs on the imports of good 2, the resulting equilibrium is the same as Simulation 12. In other words, as t increases from 0.00 to 0.20, K_H^* increases from 0 to 300, b decreases from 1.00 to 0.91, A_1 and A_2 decrease from 1.995 and 5.012 to 1.814 and 4.556 respectively. The main insight of the simulation is show by Figure 1. In that figure, both capital inflow (left axis) and welfare (right axis) are plotted against the import tariff rate. The line labeled as *welfare with increasing tariffs* refers to the welfare for the case in which A_1 and A_2 decrease with the increase in K_H^*. As can be seen, as t increases from 0.00 to 0.20, K_H^* increases from 0 to 300 and welfare increases from 107.872 to 120.152. The main contribution to the welfare increase is the spillover effect of foreign investment on the productivity of domestic firms. Next, we reverse the orientation of trade policy but assume that the productivity gain attained by domestic firms does not dissipate with a withdrawal of foreign investment. The resulting welfare is labeled as *welfare with decreasing tariffs*. As illustrated by Figure 1, a reduction in the level of import

protection can raise welfare. In our simulation, welfare reaches an approximate peak (120.721) at $t = 0.15$. This optimal tariff rate is computed for the case in which the tax benefit (at 30%) from foreign investment is not offset by the cost of public spending foreign firms should share. If we reduce the net tax benefit from foreign investment, the optimal tariff rate would be much closer to free trade.

V. Conclusion

In the present paper, we have presented a model of foreign investment relevant to developing economies. The distinction of the present model is to incorporate two additional benefits of foreign investment: the spillover effect and the wage premium effect of foreign investment on top of the tax revenue effect of foreign investment. The present model provides a useful conceptual framework to evaluate the benefits of foreign investment against the cost of trade-distorting import protection. Though the results of our simulation are not sufficient to establish a general proposition, they do spotlight a main insight: spillovers are likely to be the most important benefit that can potentially rationalize tariff-jumping foreign investment. The income taxes paid by foreign firms, by themselves, are not likely to justify the efficiency loss due to the distortion of import protection. Put it differently, foreign investment, even though it is costly, can be an effective means to shake up less efficient domestic firms and force them to improve their competitiveness through learning and competition. In essence, the implicit subsidy to foreign investment through import restrictions is a price paid to acquire advanced technologies and modern management. How effective can such a strategy of industrialization be for developing economies? There has been mixed evidence. The experiences of Japan and Korea demonstrate that foreign investment is not essential to domestic industrialization. With wise government guidance, domestic firms can grow up under important protection (the infant-industry argument) and expand into export markets. But on the other hand, the experiences of the second-tier East Asian newly industrializing economies such as Malaysia, Thailand, and China have shown that foreign investment can play a vital role in forcing domestic firms to become more efficient, more innovative, and more competitive.

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Table 1 Simulation Results

		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13
Exogenous variables														
Wage premium	β	1.00	1.00	1.00	1.00	0.91	0.91	0.91	0.91	1.00	1.00	0.91	0.91	0.91
Cost function scalar, sector 1, home	A_1	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.81	1.81	1.81	1.81	1.81
Cost function scalar, sector 2, home	A_2	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	4.56	4.56	4.56	4.56	4.56
Import tariff rate	t	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.00
Tax rate on the income of foreign capital	t	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Inflow of foreign capital, home	K^*_H	0	0	150	300	150	300	150	300	150	300	150	300	150
Endogenous variables														
Utility, home	U	107.87	108.02	105.06	102.16	105.57	103.15	108.90	109.77	118.97	119.44	119.33	120.15	121.09
Utility, foreign	U^*	262.94	260.85	265.15	269.40	264.75	268.61	261.41	261.97	261.53	262.07	261.27	261.54	261.55
Exports of good 1, home	X_1	86.38	48.46	38.76	29.29	39.58	30.85	36.63	25.02	39.55	27.39	40.43	29.05	80.70
Imports of good 2, home	X_2	118.40	70.00	28.55	-12.49	30.72	-8.28	34.48	-0.76	38.42	2.45	40.32	6.14	96.08
Value of home exports of good 1	p_1X_1	68.18	42.17	33.56	25.23	34.31	26.64	31.75	21.60	31.27	21.56	32.00	22.92	58.24
Value of home imports of good 2	p_2X_2	68.18	42.17	17.00	-7.35	18.34	-4.90	20.58	-0.45	21.00	1.33	22.10	3.34	50.97
Payment for foreign capital	$(1-\tau)r^*_HK^*_H$	0.00	0.00	16.56	32.58	15.97	31.55	11.17	22.05	10.26	20.23	9.89	19.58	7.27
Supply of good 1, home	S_1	178.51	146.91	134.20	121.78	135.56	124.40	135.63	124.55	147.94	135.88	149.23	138.37	184.52
Supply of good 2, home	S_2	7.89	48.51	53.99	59.42	53.57	58.59	53.49	58.43	60.25	65.47	59.88	64.74	17.17
Supply of good 2, foreign firms	S^*_{2H}	0.00	0.00	33.11	65.90	31.83	63.42	31.82	63.40	31.92	63.57	30.68	61.17	27.98
Supply of good 1, foreign	S_1^*	138.20	168.57	181.12	193.39	180.16	191.55	180.30	191.83	177.95	189.93	177.03	188.18	143.55
Supply of good 2, foreign	S_2^*	426.25	383.52	348.30	313.45	349.70	316.14	349.49	315.73	352.90	318.50	354.22	321.04	401.14
The price of good 1	p_1	0.789	0.870	0.866	0.862	0.867	0.864	0.867	0.863	0.790	0.787	0.791	0.789	0.722
The price of good 2	p_2	0.576	0.602	0.595	0.589	0.597	0.592	0.597	0.592	0.547	0.541	0.548	0.544	0.531
The rental rate, home	r	0.045	0.063	0.062	0.061	0.062	0.061	0.062	0.061	0.063	0.062	0.063	0.062	0.046
The wage rate, foreign firms	w^*_H	1.000	1.000	1.000	1.000	1.100	1.100	1.100	1.100	1.000	1.000	1.100	1.100	1.100
The rental rate, foreign firms	r^*_H	0.081	0.112	0.110	0.109	0.106	0.105	0.106	0.105	0.098	0.096	0.094	0.093	0.069
The wage rate, foreign	w^*	1.500	1.720	1.720	1.720	1.720	1.720	1.720	1.720	1.563	1.563	1.563	1.563	1.364
The rental rate, foreign	r^*	0.068	0.069	0.067	0.066	0.068	0.067	0.068	0.067	0.062	0.061	0.062	0.062	0.063
Tariff revenue	tp_1X_1	0.00	8.43	3.40	-1.47	3.67	-0.98	4.12	-0.09	4.20	0.27	4.42	0.67	0.00
Corporate income tax	$tr^*_HK^*_H$	0.00	0.00	0.00	0.00	0.00	0.00	4.79	9.45	4.40	8.67	4.24	8.39	3.12
Income, home	Y	145.45	171.33	165.26	159.38	166.42	161.63	171.61	171.89	171.35	170.78	172.22	172.50	149.85
Income, foreign	Y^*	354.55	377.69	380.74	383.69	380.99	384.20	376.06	374.47	343.86	342.07	344.22	342.77	323.69
Demand for good 1, home	D_1	92.13	98.45	95.44	92.50	95.98	93.56	99.00	99.54	108.38	108.49	108.80	109.32	103.82
Demand for good 2, home	D_2	126.30	118.51	115.65	112.83	116.11	113.73	119.79	121.06	130.59	131.49	130.88	132.06	141.23
Demand for good 1, foreign	D^*_1	224.58	217.03	219.88	222.67	219.73	222.40	216.94	216.85	217.50	217.31	217.46	217.23	224.25
Demand for good 2, foreign	D^*_2	307.85	313.52	319.75	325.94	318.98	324.42	315.00	316.49	314.48	316.05	313.90	314.90	305.07

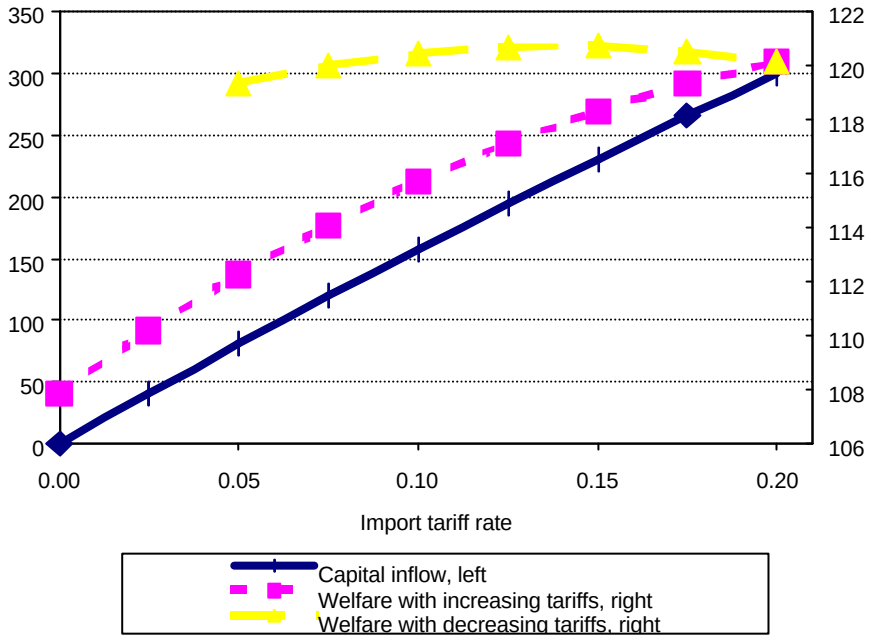

Figure 1 The Effects of Import Tariffs on Capital Inflow and Welfare